FILE 'USPAT' ENTERED AT 11:13:10 ON 29 SEP 1999

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L1 QUE (AIRBAG OR GASBAG OR (AIR OR GAS) (W) BAG OR RESTRAI NT) AND (149/CLAS OR 280/CLAS)

L2 4897 (AIRBAG OR GASBAG OR (AIR OR GAS) (W) BAG OR RESTRAINT) AND (149/CLAS OR 280/CLAS)

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L3 10 L2 AND EUTECTIC

1. 5,959,242, Sep. 28, 1999, Autoignition composition; Gregory D. Knowlton, et al., 149/38, 36, 37, 45

2. 5,866,842, Feb. 2, 1999, Low temperature autoigniting propellant composition; Kimberly A. Wilson, et al., 149/19.6, 19.91, 35, 46

3. 5,850,053, Dec. 15, 1998, **Eutectic** mixtures of ammonium nitrate, guanidine nitrate and potassium perchlorate; Robert S. Scheffee, et al., 149/19.91; 60/219; 149/36, 47

4. 5,847,315, Dec. 8, 1998, Solid solution vehicle airbag clean gas generator propellant; Arthur Katzakian, Jr., et al., 149/19.91, 19.1, 36, 46

6. 5,747,730, May 5, 1998, Pyrotechnic method of generating a particulate-free, non-toxic odorless and colorless gas; Robert S. Scheffee, et al., 149/47; 60/205; 149/19.91; 264/3.1; 280/741

7. 5,739,460, Apr. 14, 1998, Method of safely initiating combustion of a gas generant composition using an autoignition composition; Gregory D. Knowlton, et al., 102/324, 205; 149/45, 109.6; 280/741

8. 5,726,382, Mar. 10, 1998, **Eutectic** mixtures of ammonium nitrate and amino guanidine nitrate; Robert S. Scheffee, et al., 149/19.91, 47, 62

9. 5,641,938, Jun. 24, 1997, Thermally stable gas generating composition; Gary F. Holland, et al., 149/48, 60, 78

10. 5,545,272, Aug. 13, 1996, Thermally stable gas generating composition; Donald R. Poole, et al., 149/48, 78

US PAT NO: 5,959,242 L3: 1 of 10

BSUM(14) Typically, . . . earth chloride, fluoride, or bromide comelted with a nitrate, nitrite, chlorate, or perchlorate, such that the autoignition composition has a **eutectic** or peritectic in the range of about 80.degree. C. to about 250.degree. C. In addition, for compositions with low output. . .

BSUM(38) A . . . a thermal event clearly visible on a DSC scan, such as a crystalline phase transition, a melting point, or a **eutectic** or peritectic point. In some of the organic and mixed inorganic/organic systems it appears that autoignition of larger mass samples. . .

BSUM(40) The . . . each oxidizer component in a mixture or comelt depends on the molar amounts of the oxidizers at or near the **eutectic** point for the specific oxidizer mixture or comelt composition. As a result the nitrate, nitrite, chlorate or perchlorate oxidizer component. . .

BSUM(47) For . . . mechanical mix, or of the single oxidizer in simpler systems. In binary and ternary comelt systems, autoignition occurs near a **eutectic** or peritectic point. In all of the cases described above, the oxidizer softens or melts producing a kinetically favorable environment. . .

BSUM(48) Each system of comelted oxidizers is unique. A simple binary system can have a single **eutectic** point, as described by the phase diagram of the system, that results in a single autoignition temperature for a specific. . .

BSUM(49) Other more complicated binary and ternary comelts can have **eutectic** and peritectic points that result in several different autoignition temperatures for a specific metal/comelt system. The autoignition temperature of the. . . less than 58 mole percent AgNO.sub.3, based on the weight of the comelt, but has an autoignition temperature near the **eutectic** point of 118.degree. C. for comelts with 58 mole percent AgNO.sub.3 or higher.

BSUM(50) The **eutectic** and peritectic melting points of a binary system tends to set the upper limit for any ternary system containing the specific binary combination of oxidizers. In other words, the melting point or **eutectic** of a ternary system cannot be higher than the lowest melting point of a binary combination within it.

DETD(8) There . . . A composition with a weight percent of AgNO.sub.3 greater than 44.6% of the autoignition composition melts and autoignites at the **eutectic** at 118.+-.2.degree. C. However, with a weight percent of AgNO.sub.3 of less than 44.6%, the composition melts and autoignites at. . .

US PAT NO: 5,866,842 L3: 2 of 10

BSUM(16) The . . . 130.degree. C. to 150.degree. C. Preferred oxidizers include ammonium nitrate (AN), ammonium nitrate phase-stabilized with potassium nitrate (AN/KN), and the **eutectic** which ammonium nitrate forms with nitroguanidine (AN/NQ).

BSUM(17) The . . . triaminoguanidine nitrate, and hydrazinium nitrotriazolone may also be used. It is also possible to use oxidizer/fuel mixtures, such as the **eutectic** that ammonium nitrate forms with 3-nitro-1,2,4-triazol-5-one (AN/NTO).

BSUM(22) The . . . invention includes low temperature melting oxidizers, such as ammonium nitrate (AN), ammonium nitrate phase-stabilized with potassium nitrate (AN/KN), or the **eutectic** which ammonium nitrate forms with nitroguanidine (NQ) in the propellant formulation. Oxidizer/fuel mixtures, such as the **eutectic** that ammonium nitrate forms with 3-nitro-1,2,4-triazol-5-one (AN/NTO) may also be implemented.

BSUM(23) Preferably, . . . to about 60 percent by weight of the total composition. Since ammonium nitrate melts at about 169.degree. C., the AN/NQ **eutectic** melts at about 135.degree. C., the AN/NTO **eutectic** melts at about 145.degree. C., the oxidizer liquifies and become much more reactive in the lower temperature ranges. While not. . .

CLMS(4) 4. . . . low temperature melting oxidizer is selected from the group consisting of ammonium nitrate, ammonium nitrate phase-stabilized with potassium nitrate, the **eutectic** which ammonium nitrate forms with nitroguanidine, and the **eutectic** that ammonium nitrate forms with 3-nitro-1,2,4-triazol-5-one.

US PAT NO: 5,850,053 L3: 3 of 10
TITLE: **Eutectic** mixtures of ammonium nitrate, guanidine nitrate and potassium perchlorate

ABSTRACT: A **eutectic** solution of ammonium nitrate and either aminoguanidine nitrate (AGN) or guanidine nitrate (AN) in the form of a pressed pellet. . . such as the inflation of an occupant restraint air bag. The use of the material in the form of a **eutectic** totally eliminates pellet cracking. Moreover, the addition of a minor amount of potassium perchlorate to the **eutectic** solution improves stability at 107.degree. for

BSUM(2) The present invention relates to a **eutectic** solution-forming mixture of ammonium nitrate (AN) and either aminoguanidine nitrate (AGN) or guanidine nitrate (GN) and potassium perchlorate (KClO.sub.4)

BSUM(11) The . . . in Examples 3 and 5. However, compared with the present invention, the composition disclosed in the patent is not a **eutectic** solution-forming mixture. Likewise, see U.S. Pat. No. 3,739,574, col. 2, in the Table. On the other hand, U.S. Pat. No.. . . are ammonium nitrate and aminoguanidine nitrate. The two materials are not disclosed in admixture and, obviously, are not in a **eutectic** composition.

BSUM(12) Similarly, . . . nitrate. See Examples 2 through 5. However, neither the specific components of the aminoguanidine nitrate compositions at hand, nor any **eutectic** compositions, are disclosed therein.
BSUM(13) In . . . at columns 3-4. However, the compositions do not include aminoguanidine nitrate and do not characterize any composition as forming a **eutectic** solution.

BSUM(15) Also, . . . fails to disclose a specific composition including the same nitrates as are disclosed herein and clearly does not teach a **eutectic** composition containing said components.
BSUM(16) Many . . . have been employed, but not with the particular materials of the present invention. See U.S. Pat. No. 5,411,615 disclosing a **eutectic** of AN/GN/ethylene diamine dinitrate (EDDN) plus ammonium perchlorate (AP). Of course, a drawback to the use of AP is the. . .

BSUM(17) A . . . agents. The patentee does not use the perchlorate as a stabilizer, does not include ammonium nitrate, does not employ a **eutectic** solution and is not concerned with generating gas for inflating air bags in automobiles.

BSUM(18) Finally, . . . cellulose acetate and potassium perchlorate. The patent does not suggest the additional inclusion of ammonium nitrate, the use of a **eutectic** or the recited ratios of components comprising the instant invention.

BSUM(20) The invention in our co-pending application Ser. No. 08/508,350 involves **eutectic** mixtures of ammonium nitrate and guanidine nitrate or aminoguanidine nitrate with a potassium nitrate stabilizer, as well as a method. . . of a particulate-free, non-toxic, odorless and colorless gas, an enclosed pressure chamber having an exit port is provided; a solid **eutectic** solution comprising ammonium nitrate and either aminoguanidine nitrate or guanidine nitrate is disposed within said chamber; means are then provided for igniting said **eutectic** solution in response to a sudden deceleration being detected by a detection device in the pressure chamber, whereby gas is. . .

DETD(2) **Eutectic** mixtures of ammonium nitrate and aminoguanidine nitrate or guanidine nitrate, it has been found, eliminate pellet cracking and substantially reduce. . . ammonium nitrate phase change due to temperature cycling. Moreover, the addition up to about 10% potassium nitrate to the noted **eutectic** stabilizes the ammonium nitrate, totally eliminates the ammonium nitrate phase change and maintains the freedom from cracking of the pressed. . .

DETD(3) Although . . . earlier invention provides desirable improved results, it has now been discovered that certain other benefits are unexpectedly obtained in the **eutectic** solution-forming mixture of AN and AGN or GN by employing KClO.sub.4, instead of KN, as the stabilizer for such composition.. . .

DETD(6) To . . . cycling, it is proposed to mix the ammonium nitrate oxidizer with aminoguanidine nitrate or guanidine nitrate and then form a **eutectic** solution which avoids some of the problems previously encountered and discussed above. Thus, the provision of the ammonium nitrate/aminoguanidine nitrate or the AN/GN as a **eutectic** in the form of a pressed pellet provides a generator to produce a particulate-free, non-toxic, odorless, and colorless gas for. . .

DETD(7) When . . . KP+5.0% PVA, by weight, is prepared by dissolving all the ingredients in water and mixing down to dryness, a low-melting **eutectic** is formed; melting point=119.7.degree. C. The crumb was granulated and compacted into tablets, 0.5" diameter X 0.0701" thick, having a. . .

DETD(8) Earlier work showed that the **eutectic** formulation stabilized with potassium nitrate (KN) instead of KP, composed of 30% GN+60% AN+5% KN+5% PVA and prepared as above,. . .

DETD(10) In addition, it has been discovered that the same **eutectic** employed to generate the gases may also be used as the igniter in the inflator device. By so utilizing the same **eutectic** for igniting the propellant, the inventors are able to eradicate the smoke that would otherwise be present in the exhaust. For the igniter load, the **eutectic** is provided as a powder, granulate, monolithic composite or any other form that may conveniently be disposed in the generator.

DETD(13) FIG. . . . heat flow as measured by a differential scanning calorimiter is shown for four formulations: (1) pure AN; (2) a 50/50 **eutectic** mixture of AN and GN; (3) a **eutectic** mixture of 49.125AN/49.125GN/1.75KN, and (4) a **eutectic** mixture of 47.4AN/35GN/12.6KP/5PVA.

DETD(14) (1) the low-temperature AN transitions at 52.575.degree. C. in pure AN and 53.537.degree. C. in the 50/50 AN/GN **eutectic** disappear in the AN/GN/KN and the AN/GN/KP/PVA eutectics, and

DETD(15) (2) the intermediate transitions at 88.987.degree. C. in pure AN and 89.464.degree. C. in the 50/50 AN/GN **eutectic** increase with potassium content to 98.625.degree. C. at 1.75% KN (0.68% K) and to 113.16.degree. C. at 12.6% KP (3.6%. . .

DETD(16) Secondly, a number of **eutectic** mixtures were prepared by dissolving all the ingredients in water and mixing down to dryness. The crumb was granulated and. . .

DETD(17) TABLE 1
EFFECT OF PVA ON THE TEMPERATURE CYCLING OF AN/GN/KP **EUTECTIC**
COMP COMPOSITION, WT % DIAMETER, . . .

CLMS(7) 7. . . . comprising the steps: a) providing an enclosed pressure chamber having exit ports, b) disposing within said chamber, a gas-generative solid propellant **eutectic** solution comprising ammonium nitrate, either aminoguanidine nitrate or guanidine nitrate, and potassium perchlorate, and
c) providing means for igniting said **eutectic** solution upon detection by a sensor of the pressure chamber being subjected to a sudden deceleration, whereby gas is substantially. . .

CLMS(14) 14. . . . igniting said composition in response to the detection of a sudden deceleration, the improvement wherein the propellant composition comprises a **eutectic** solution containing ammonium nitrate, at least one of aminoguanidine nitrate and guanidine nitrate, and a minor effective stabilizing amount of.

US PAT NO: 5,847,315 L3: 4 of 10

ABSTRACT: An . . . binder, usually polyvinylamine nitrate or polyethyleneimmonium nitrate, an oxidizer mixture comprising ammonium nitrate and a first additive which produces an **eutectic** melt which is liquid at a temperature well below the melting point of the ammonium nitrate as well as that. . .

BSUM(3) Compositions . . . gases with associated low solids and toxicity production. In particular, the subject invention describes a process utilizing ammonium nitrate based **eutectic** oxidizer mixtures in combination with polyalkylammonium nitrate binders to create solid solution propellants.
BSUM(19) Sumrall et al. in U.S. Pat. No. 5,411,615 described the use of a four component **eutectic** consisting of dicyandiamide, ammonium nitrate, guanidine nitrate and ethylene diamine dinitrate as a bonding agent for an insensitive high explosive. The ingredients of the explosive, aluminum, RDX, and ammonium perchlorate were added to the liquified **eutectic** mixture at 185.degree. F. in the mixer. After blending, the mixture was cooled and solidified to form a finely dispersed. . .
BSUM(20) Kruse . . . in U.S. Pat. No. 3,729,351 the fabrication of flares by dry blending of metal powders and ground binary or ternary **eutectic** mixtures of alkali and alkaline earth metal nitrates. . . .

BSUM(21) Yet another example of the use of **eutectic** mixtures was given by Klunsch et al in U.S. Pat. No. 3,926,696. Various multicomponent eutectics, an example of which consists. . . liquid below -10.degree.

C. An example of such an explosive contained 52.5% ammonium nitrate, 3% sodium nitrate, 22.5% of the **eutectic** mixture and 22% aluminum. The **eutectic** served to keep ingredients in a slurry state. The liquid or slurry state makes these compositions unsuitable for automotive air. . .

BSUM(40) One example of an AN based **eutectic** is hydrazine nitrate/ammonium nitrate in a 65/35 weight ratio, respectively. This **eutectic** melts at .about.47.degree. C. When melted and combined with PVAN it forms a rubbery propellant by "swelling" into it. The. . .

BSUM(43) In order to achieve formulations with dimensional stability .gtoreq.110.degree. C., a higher melting **eutectic** than that achieved with HN/AN was needed. We found that guanidine nitrate and aminoguanidine nitrate form **eutectic** melting points with ammonium nitrate (AN), respectively, at .about.130.degree. C. and .about.113.degree. C. The **eutectic** compositions by weight are AN/GN, 84.5/15.5 by weight and AN/AGN, 75/25 by weight. The AGN confers .about.20.degree. C. greater thermal stability by DSC (.about.250.degree. C.) to the **eutectic** than does GN (.about.230.degree. C.), however, both eutectics have more than ample stability. Propellants were formulated with polyvinylamine nitrate polymer and CrATZ and the chromium nitrate burning rate catalysts and were oxygen balanced with the **eutectic** oxidizers to produce water, carbon dioxide, and nitrogen gases. Other additives such as 5-aminotetrazole nitrate, urea nitrate, and equivalent compounds. . .

BSUM(47) A typical desired stoichiometric formulation consists of approximately 16.4% PVAN, 81.6% **eutectic** oxidizer, and 2% burning rate modifier. It was found that such formulations could maintain dimensional stability at temperatures as high. . .

BSUM(49) The . . . without perceptible deterioration. The relative insensitivity to ignition of these systems is typified by the following values for the HN/AN **eutectic** gas generator propellant.

BSUM(50) TABLE 1

Impact Sensitivity	>200 kg-cm for the HN/AN **eutectic**
Friction Sensitivity	>300 lb at 3 ft-sec for the HN/AN **eutectic**

BSUM(51) The . . . of non-toxic gases generated per gram of propellant, all in a solid solution propellant formulation consisting primarily of an inorganic **eutectic** nitrate oxidizer and polyalkylammonium nitrate polymer. Minor formulation constituents consist of combustion catalysts and ballistic additives.

BSUM(53) TABLE 2

Formulations

Ingredient	Approximate Weight %
Polyvinylamine nitrate binder	8 to 20
Eutectic of HN/AN	57 to 83
Additional AN and **eutectic** additive beyond that used in the initial **eutectic** composition	0 to 20
Combustion modifier additive	0 to 6

DETD(5)

Propellant ingredient	Weight %
AN/HN **eutectic**	81.00
PVAN	17.00
CrNO.sub.3	2.00

DETD(9)

Propellant ingredient	Weight %
AN/HN **eutectic**	71.00

AN	10.00
PVAN	17.00
CrNO.sub.3	2.00

DETD(10) The oxidizer which consisted of the **eutectic** and added AN had to be heated to .about.70.degree. C. in order to be completely liquified. The propellant was processed. . .

DETD(23)

Propellant ingredient	Weight %
AN/AGN **eutectic**	86.39
PVAN	10.35
CrATZ	3.26

DETD(24) This . . . 10.degree. C./minute in air indicated a peak exotherm nearly 20.degree. C. higher than for the propellants made with the AN/GN **eutectic**. The burning rate for this propellant was measured at 0.30 in/sec at 1000 psi. The processing procedure used in Example. . .

DETD(26)

Propellant ingredient	Weight %
AN/GN **eutectic**	84.75
PVAN	11.50
CrATZ	2.00
Polyox	1.50
DHAP	0.20
Sorbitan monostearate	0.05

CLMS(1) What . . . said polyalkylammonium binder is polyvinylamine nitrate and b) an oxidizer mixture comprising ammonium nitrate and a first additive which produces an **eutectic** melt which is liquid at a temperature well below the melting point of said ammonium nitrate as well as that. . .

CLMS(13) 13. . . . a polyalkylammonium binder comprising polyvinylamine nitrate and b) an oxidizer mixture comprising ammonium nitrate and a first additive which produces an **eutectic** melt which is liquid at a temperature well below the melting point of said ammonium nitrate as well as that. . .

US PAT NO: 5,747,730 L3: 6 of 10

ABSTRACT: An essentially particulate-free, non-toxic, odorless and colorless gas is generated in a pyrotechnic inflator device by using a **eutectic** solution of ammonium nitrate, guanidine nitrate and/or aminoguanidine nitrate, and minor amounts of polyvinyl alcohol and either potassium nitrate or. . .

BSUM(2) The instant invention involves an improved method of using a **eutectic** solution of ammonium nitrate (AN), guanidine nitrate (GN) and/or aminoguanidine nitrate (AGN), and with minor amounts of polyvinyl alcohol (PVA). . .

BSUM(10) The . . . lack an amino group, as in the aminoguanidine nitrate embodiment, but the composition disclosed in the patent is not a **eutectic** solution-forming mixture. Likewise, see U.S. Pat. No. 3,739,574, col. 2, in the table. On the other hand, U.S. Pat. No.. . . are ammonium nitrate and aminoguanidine nitrate. The two materials are not disclosed in admixture and, obviously, are not in a **eutectic** composition.

DETD(3) **Eutectic** mixture of AN, GN and/or AGN, or TAGN or NQ and minor amounts of KN and/or KP, and PVA have. . . phase change due to temperature cycling. Although the addition of about 1 to about 2% potassium nitrate to an AN/GN **eutectic** totally eliminates the ammonium nitrate phase change, it is not sufficient to prevent cracking of the pressed pellet upon temperature. . .

DETD(32) The . . . the AN/AGN eutectics, both of which are much greater than the 5.67 without either GN, AGN, or PVA in the **eutectic**.

DETD(33) The . . . products, as K.sub.2 CO.sub.3. The next two entries (125 and 126) show that the PVA must be dissolved in the **eutectic** to be effective. Adding the PVA to the AN/GN/KN **eutectic** as a dry powder resulted in unacceptable changes during cycling.

CLMS(1) We . . . the steps: a) providing a gas generator having an enclosed chamber with exit ports, b) disposing within said chamber, a solid **eutectic** propellant solution comprising gas-generative effective amounts of ammonium nitrate (AN) and at least one of aminoguanidine nitrate (AGN) and guanidine. . . (PVA) and either potassium nitrate (KN) or potassium perchlorate (KP) as the sole source of gas, and c) providing said solid **eutectic** solution also as the means for igniting the propellant **eutectic** solution upon detecting that the pressure chamber is being subjected to a sudden deceleration, whereby gas is essentially instantly generated. . .

US PAT NO: 5,739,460 L3: 7 of 10

BSUM(14) Typically, . . . earth chloride, fluoride, or bromide comelted with a nitrate, nitrite, chlorate, or perchlorate, such that the autoignition composition has a **eutectic** or peritectic in the range of about 80.degree. C. to about 250.degree. C. In addition, for compositions with low output. . .

BSUM(38) A . . . a thermal event clearly visible on a DSC scan, such as a crystalline phase transition, a melting point, or a **eutectic** or peritectic point. In some of the organic and mixed inorganic/organic systems it appears that autoignition of larger mass samples. . .

BSUM(40) The . . . each oxidizer component in a mixture or comelt depends on the molar amounts of the oxidizers at or near the **eutectic** point for the specific oxidizer mixture or comelt composition. As a result the nitrate, nitrite, chlorate or perchlorate oxidizer component. . .

BSUM(47) For . . . mechanical mix, or of the single oxidizer in simpler systems. In binary and ternary comelt systems, autoignition occurs near a **eutectic** or peritectic point. In all of the cases described above, the oxidizer softens or melts producing a kinetically favorable environment. . .

BSUM(48) Each system of comelted oxidizers is unique. A simple binary system can have a single **eutectic** point, as described by the phase diagram of the system, that results in a single autoignition temperature for a

BSUM(49) Other more complicated binary and ternary comelts can have **eutectic** and peritectic points that result in several different autoignition temperatures for a specific metal/comelt system. The autoignition temperature of the. . . less than 58 mole percent AgNO.sub.3, based on the weight of the comelt, but has an autoignition temperature near the **eutectic** point of 118.degree. C. for comelts

BSUM(50) The **eutectic** and peritectic melting points of a binary system tends to set the upper limit for any ternary system containing the specific binary combination of oxidizers. In other words, the melting point or **eutectic** of a ternary system cannot be higher than the lowest melting point of a binary combination

CLMS(10) 10. . . . alkaline earth fluoride, or alkaline earth bromide with a nitrate, nitrite, chlorate or perchlorate, thereby forming a composition having a **eutectic** or peritectic in the range of about 80.degree.

US PAT NO: 5,726,382 L3: 8 of 10
TITLE: **Eutectic** mixtures of ammonium nitrate and amino guanidine nitrate

ABSTRACT: A **eutectic** solution of ammonium nitrate and either aminoguanidine nitrate (AGN) or guanidine nitrate (AN) in the form of a present pellet. . . such as the inflation of an occupant restraint air bag. The use of the material in the form of a **eutectic** totally eliminates pellet cracking. Moreover, the addition

of a minor amount of potassium nitrate to the **eutectic** solution eliminates the ammonium nitrate phase change due to temperature cycling without adversely affecting the pressed pellets' freedom from cracking. . .

BSUM(2) The present invention relates to a **eutectic** solution-forming mixture of ammonium nitrate (AN) and either aminoguanidine nitrate (AGN) or guanidine nitrate (GN) and optionally potassium nitrate (KN). . .

BSUM(11) The . . . lack an amino group, as in the aminoguanidine nitrate embodiment, but the composition disclosed in the patent is not a **eutectic** solution-forming mixture. Likewise, see U.S. Pat. No. 3,739,574, col. 2, in the Table. On the other hand, U.S. Pat. No.. . . are ammonium nitrate and aminoguanidine nitrate. The two materials are not disclosed in admixture and, obviously, are not in a **eutectic** composition.

BSUM(12) Similarly, . . . nitrate. See Examples 2 through 5. However, neither the specific components of the aminoguanidine nitrate compositions at hand, nor any **eutectic** compositions, are disclosed therein.

CLMS(1) 1. A composition for generating a substantially particulate-free, non-toxic, odorless and colorless gas comprising: a **eutectic** solution of ammonium nitrate and either aminoguanidine nitrate or guanidine nitrate, together with a minor amount of potassium nitrate, a. . .

US PAT NO: 5,641,938 L3: 9 of 10

BSUM(22) U.S. . . . nitrate, nitroguanidine and ethylenediamine dinitrate. This composition was developed for explosive applications with an intent to replace TNT (2,4,6-trinitrotoluene). The **eutectic** formed when ammonium nitrate, ethylene diamine dinitrate and guanidine nitrate are mixed in the disclosed proportion has

US PAT NO: 5,545,272 L3: 10 of 10

BSUM(20) U.S. . . . nitrate, nitroguanidine and ethylenediamine dinitrate. This composition was developed for explosive applications with an intent to replace TNT (2,4,6-trinitrotoluene). The **eutectic** formed when ammonium nitrate, ethylene diamine dinitrate and guanidine nitrate are mixed in the disclosed proportion has

L4 41 L1 AND (GUANIDINE (W) NITRATE OR AMINOGUANIDINE (W) NITRATE)

41. 5,386,775, Feb. 7, 1995, Azide-free gas generant compositions and processes; Donald R. Poole, et al., 102/289, 290; **149/36**

L5 11051 AMMONIUM (W) NITRATE
L6 73 L2 AND L5
L7 204 L5 (P) MELT
L8 3 L7 AND L2

1. 5,936,195, Aug. 10, 1999, Gas generating composition with exploded aluminum powder; Brian K. Wheatley, 149/19.91, 19.1, 43, 46, 114

2. 5,847,315, Dec. 8, 1998, Solid solution vehicle airbag clean gas generator propellant; Arthur Katzakian, Jr., et al., 149/19.91, 19.1, 36, 46

3. 5,551,725, Sep. 3, 1996, Vehicle airbag inflator and related method; Christopher P. Ludwig, 280/737; 102/531; 222/3; 280/741; 422/166

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